CCSF 1994 NPDES Permit Program

ATTACHMENT COVER SHEET

Attachment # 4 - Demonstration of compliance with the "presumption" approach of the *CSO Control Policy*

Date: 3/18/94

Demonstration of CCSF Compliance with the "Presumption" Approach of the *CSO Control Policy*

A. Summary

This document compares the performance of the San Francisco wet weather controls with the requirements of the "presumption" approach as identified in the *Combined Sewer Overflow Control Policy*. The "presumption" approach is one of two methods that municipalities can use to demonstrate compliance with water quality standards. The "presumption" approach requires that combined sewer communities develop a plan to implement a specified level of stormwater control. Because San Francisco has already substantially implemented a CSO control program, it is exempt from the planning and construction provisions which include the "presumption" approach. Nevertheless, it is useful to compare San Francisco with these provisions of the *Combined Sewer Overflow Control Policy* in order to judge the adequacy of previous wastewater control planning.

San Francisco's program began in 1974 with the completion of the Master Plan EIS/EIR. One of the main goals was to bring the City's wet weather discharges into compliance with water quality standards. The water quality standards that formed the basis for the City's program were more stringent than the requirements established by the "presumption" approach. Thus the San Francisco CSO control program significantly exceeds the requirements of the "presumption" approach as outlined in the *Combined Sewer Overflow Control Policy*.

B. Introduction and Purpose

The Clean Water Act (CWA) established the National Pollutant Discharge Elimination System (NPDES) permit program. All point source discharges to waters of the U.S. must have permits issued under this program. The Clean Water Act also established the criteria which the U.S. EPA and the states use in issuing permits to these discharges. Essentially, the discharges have to comply with two sets of requirements:

- Technology-based minimum requirements which apply to all dischargers of a specified class (CWA section 301(b)(1)(A) and (B)).

- More stringent effluent limits if needed for the discharge to meet local water quality standards (CWA section 301(b)(1)(C)).

Historically, EPA has implemented a policy for CSOs that did not require construction (or very little construction) to meet the technology-based limitations. Rather, EPA focused on the need to control CSOs if necessary to meet water quality standards. As noted in other Attachments, EPA policies have now begun to require some technology-based controls, specifically the nine minimum technologies identified in the *Combined Sewer Overflow Control Policy* (EPA, 1993 draft, 1994 final [planned]).

The major emphasis of the *Combined Sewer Overflow Control Policy*, however, remains compliance with water quality standards. The *Policy* identifies two approaches for facilities to come into compliance with water quality standards: the "presumption" approach and "demonstration" approach. This document examines the "presumption" approach and compares it with the San Francisco program. Because San Francisco has already substantially implemented a CSO control program, it is exempt from the planning and construction provisions which include the "presumption" approach (see the *Policy* at I.C.1.). However, this document compares San Francisco with the "presumption" approach of the *Combined Sewer Overflow Control Policy* to evaluate the adequacy of previous wastewater control planning.

C. The "Presumption" Approach as outlined in the CSO Policy.

The *CSO Control Policy* in Section II.C.4.a. outlines the requirements of the "presumption" approach:

> a. "Presumption Approach
>
> A program that meets any of the criteria listed below would be presumed to provide an adequate level of control to meet CWA requirements, provided the permitting authority determines that such presumption is reasonable in light of the data and analysis conducted in the characterization, monitoring, and modeling of the system and the consideration of sensitive areas described above. These criteria are provided because data and modeling of wet weather events often do not give a clear picture of the level of CSO controls necessary to protect WQS. However, this presumption will not apply if the permitting authority determines that the long-term CSO control plan will not result in attainment of CWA requirements.
>
> > i. no more than an average of four overflow events per year, provided that the permitting authority may allow up to two additional overflow events per year. For the purpose of this criterion, an overflow event is one or more overflows from a combined sewer system as the result of a precipitation event that does not receive the minimum treatment specified below; or
> >
> > ii. the elimination or the capture for treatment of no less than 85% by volume of the combined sewage collected in the combined sewer system during precipitation events on a system-wide annual average basis; or
> >
> > iii. the elimination or reduction of no less than the mass of the pollutants, identified as causing water quality impairment through the sewer system characterization, monitoring, and modeling effort, for the volumes that would be eliminated or captured for treatment under paragraph ii. above.

Combined sewer flow remaining after implementation of the nine minimum controls and within the criteria specified at II.C.4.a.i, ii or iii, should receive a minimum of:

- Primary clarification. (Removal of floatables and settleable solids may be achieved by any combination of treatment technologies or methods that are shown to be equivalent to primary clarification.);
- Solids and floatables disposal; and
- Disinfection of effluent, if necessary, to meet WQS, protect designated uses and protect human health, including removal of harmful disinfection chemical residuals, where necessary.

D. San Francisco's Compliance with the "Presumption" Approach.

Introduction

San Francisco's existing level of control and treatment for CSOs has been based on attainment of water quality standards. For combined sewer systems the control requirements to meet WQS generally exceed the technology-based controls (BPT, BCT, and BAT). BCT and BAT constitute the minimum effluent limits allowed in wastewater permits. More stringent effluent limits are required if needed for the discharge to meet water quality standards (CWA section 301(b)(1)(C)). The San Francisco wastewater facilities were planned and designed in the late 1970s and early 1980s based on the need to meet water quality standards. The construction program for these facilities will be complete in 1996.

Terminology water quality-based and technology-based effluent limits

The following is a summary of the key terms used in the following discussion:

Technology-based - Refers to wastewater effluent limits based on the performance of a specific treatment technology. For example, the secondary treatment standards which apply to publicly owned treatment works (POTWs) are technology-based in that they are derived from the capabilities of the activated sludge process to treat domestic sewage.

Primary Treatment - This term does not have a regulatory definition but generally refers to the treatment capability of the primary clarifiers commonly used in treating domestic wastewater. Primary clarifiers typically attain up to 50% removal of suspended solids while treating dry weather flows. When the flow-through rates are increased during wet weather, the removal efficiency of primary clarifiers can drop as low as 35 to 40%.

Toxic pollutants - Pollutants listed by EPA in the regulations at 40 CFR 401.15. Typical examples found in CSO include copper, lead, zinc and polynuclear aromatic hydrocarbons.

Storm flows and CSOs - "Storm flows" refers to the incremental sewer flows caused by the introduction of storm water into a combined sewer system. In municipalities with a major area serviced by combined sewers, most of these storm flows are released directly from the sewers as combined sewer overflows. (Typically 5 to 15% of storm flows are captured and treated because of existing excess capacity in a system even when no specific CSO control is in place.) For purposes of calculating CSO control system performance, the entire storm flow is assessed rather than the CSO component alone. This allows for more equitable comparisons between systems. The CSO Control Policy generally bases its performance criteria on the total flow in the combined system during

et weather. The total combined sewer flow includes the storm flow plus the dry weather equivalent flow.

The *CSO Control Policy*'s Options for Compliance with WQS

The *CSO Control Policy* includes a discussion of two options for planning CSO control facilities to meet water quality standards. These include the "Presumption" approach and the "Demonstration" approach. Both of these methods address attainment of water quality standards and are not related to the BPT/BCT/BAT (minimum technology) determination.

Summary of the Presumption Approach

The *CSO Control Policy* includes a "presumption" approach for attainment of water quality standards. If a municipality complies with this approach then it is automatically "presumed" to be in compliance with water quality standards. The complete "presumption" requirement as described in the *Policy* is provided in a previous section. Simplified and summarized, the "presumption" approach requires:

- The community must meet ***one*** of the following:
    1. No more than 4 untreated overflows per year (ave.), or
    2. The treatment of 85% of the wet weather combined flow, or
    3. The reduction (in discharge) of an equivalent mass of pollutants as in 2.
- "Treatment" as used in 1. and 2. above, refers to:
    a. "Primary clarification" (or technology equivalent to primary clarification that removes floatables and settleable solids).
    b. Solids and floatables disposal
    c. Disinfection, if necessary, and removal of disinfection residuals as necessary.

Note: This summary omits some exceptions which are not relevant to the following discussion.

San Francisco Program compared with the Presumption Approach

In this comparison, we examine San Francisco's performance under the criteria of items 1., 2. and 3. above. However, compliance with only one is required.

1. Discharge of no more than 4 untreated overflows per year (ave.)

The permitted overflow frequencies for San Francisco range from 1 per year to 10 per year depending on the discharge zone. (Areas with more sensitive beneficial uses have lower frequencies.) At program completion, however, all of San Francisco's overflows will be discharges from the storage/transports and will have received flow-through treatment. Thus, San Francisco has *no* untreated overflows, assuming the flow-through treatment meets the definition of treatment as used in the *Policy*. The storage/transports are specifically designed to provide both settling and floatable

removal as mentioned in the *Policy*. Additionally, the performance of the storage/transports is in the range of the wet weather performance of primary clarifiers. At some future time, EPA will likely provide more specific guidance regarding the term "primary clarification" as used in the *Policy*. However, it is the understanding of participants in the planning process that developed the *Policy*, that treatment as defined in the *Policy* is meant to include facilities with effective settling and floatables removal controls such as the San Francisco storage/transports.

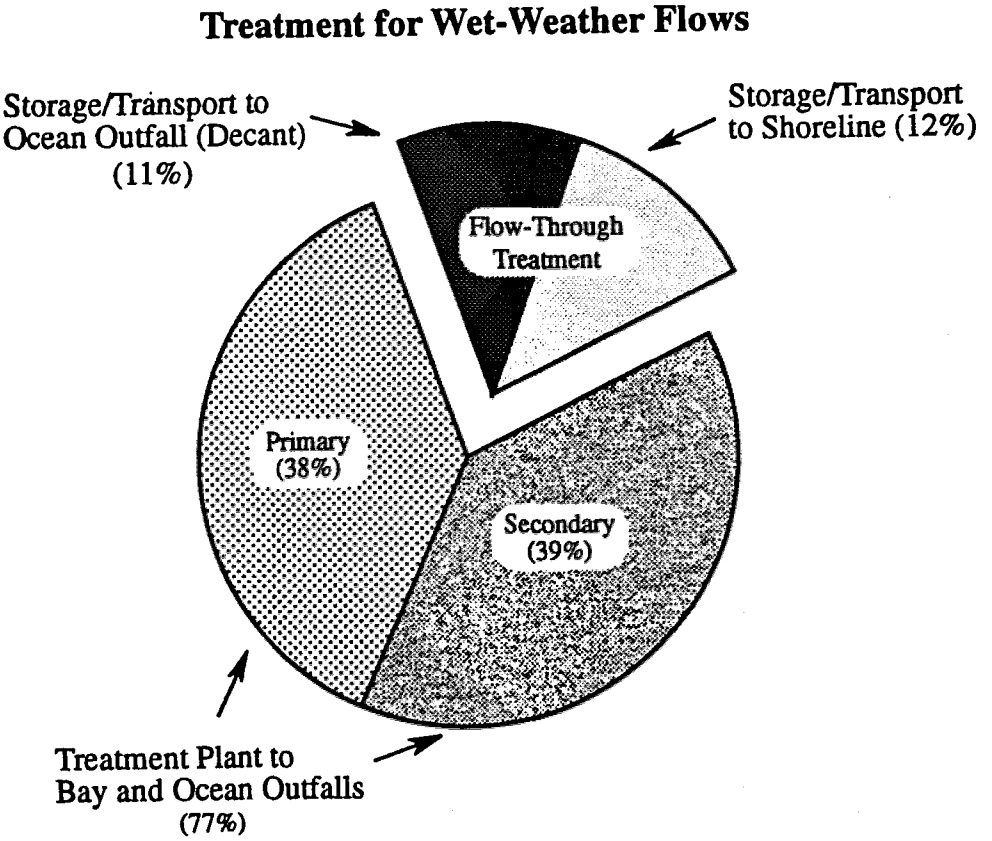
2. Treatment of 85% of the wet weather combined flow

This compliance option requires the combined sewer system to provide treatment (equivalent to primary clarification) to 85% of the combined flows on a system-wide annual basis. The San Francisco facilities will provide secondary treatment to 39% of the flow, primary to 38% of the flow and flow-through treatment within the storage/transports to the remaining 23%. See Figure 1. Assuming that flow-through treatment meets the *Policy*'s definition of treatment, as discussed above, then San Francisco provides 100% treatment and meets the criteria. As with compliance item 1., further clarification of terminology from EPA would help regarding how to incorporate consideration of the "system-wide annual basis." By providing secondary level treatment to much of the storm flow, the City system's annual performance is much superior to a program which only meets the minimum requirements of this option (85% of flow receiving primary treatment, 15% untreated). See the following discussion.

3. The reduction (in discharge) of an equivalent mass of pollutants to option 2.

This compliance option requires the municipality to achieve a pollutant reduction performance equivalent to a community which has implemented option 2. This option was included for those communities, such as San Francisco, which are implementing site-specific control programs.

Figure 1



Option 2 requires a community to provide primary clarification to 85% of the combined flow. For this calculation, we will assume that primary treatment will achieve 50% TSS removal of total suspended solids (TSS). Therefore, the overall performance of a community implementing option 2 would be:

85% (of flow) X 50% (removal of suspended solids) = **42.5% overall removal**.

- Overall removal refers to removal from the entire waste stream.

- The 50% removal efficiency assumed for primary clarifiers in wet weather is optimistic, as discussed earlier, and would likely be lower. Thus the overall removal for option 2 would probably be less than 42.5%.

San Francisco's overall pollutant removal has been calculated based on the following performance assumptions:

Treatment Process (San Francisco)	**Wet Weather Pollutant Removal Efficiency** (Percentage of total susp. solids)
Secondary	80
Primary	55
Storage/Transports	30

The 30% removal efficiency for the storage/transports is a conservative assumption based on performance studies of the Westside Transport. Depending on the type of performance assessment, the total suspended solids (TSS) removal of the Westside Transport varied from 25% to 54% (long-term average). It is very difficult to determine the removal efficiencies of the storage/transports because of the variability of pollutant loading in the storm flows and the frequent inability to obtain representative and reproducible samples.

Using the data above, San Francisco obtains an overall pollutant removal from the combined sewer flows of **59%** . This compares very favorably with the **42.5 %** overall removal required by option 3 of the presumptive approach. Figure 2 graphically presents the comparison of San Francisco's overall performance with that of the *Policy*'s presumption approach (option 3).

An additional requirement for options 1 and 2 of the presumptive approach, is that the treatment, as used in these options, should meet certain specifications:

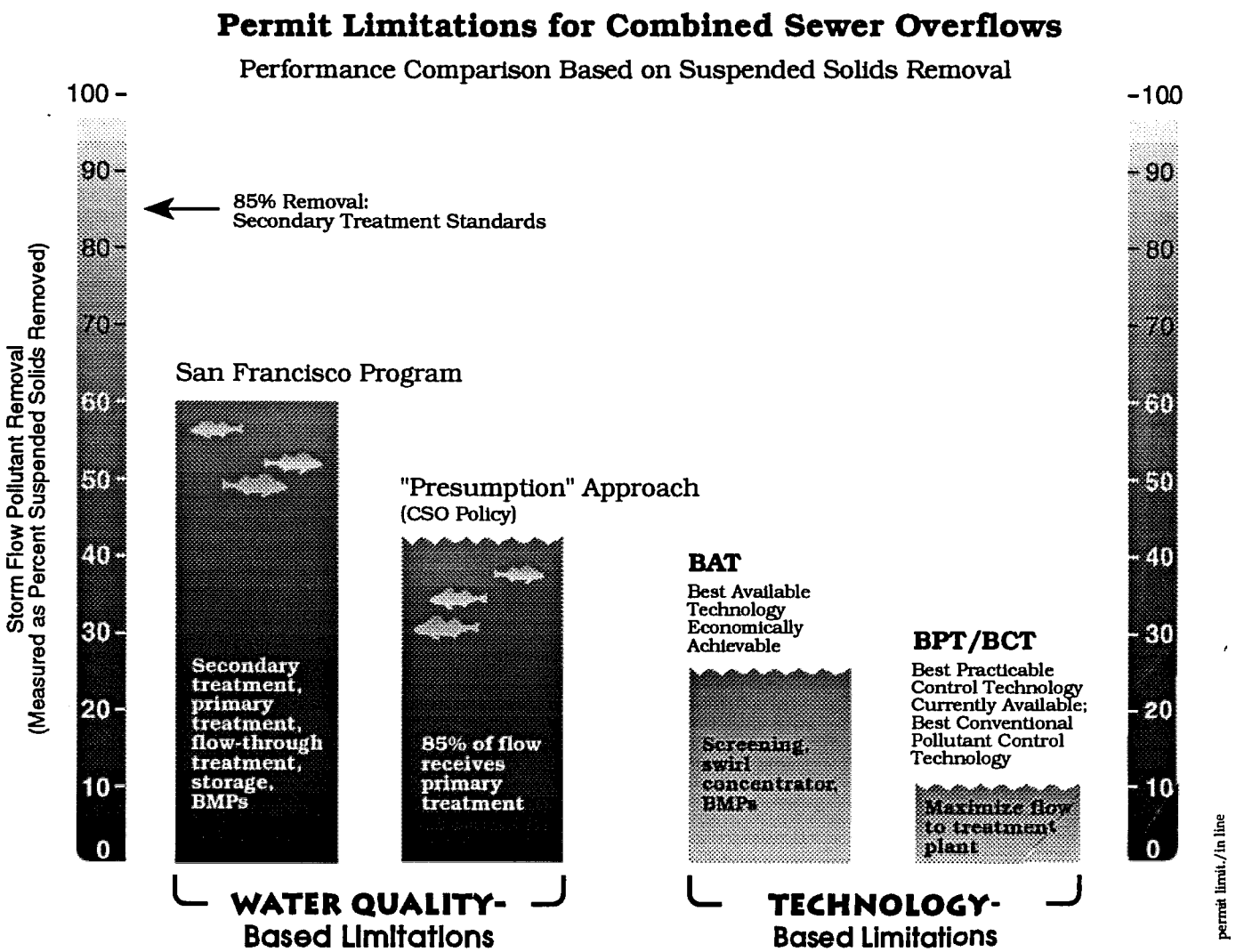
The treatment must be:

a. "Primary clarification" (or technology equivalent to primary clarification that removes floatables and settleable solids).
b. Solids and floatables disposal
c. Disinfection, if necessary, and removal of disinfection residuals as necessary.

San Francisco's secondary and primary facilities provide, at least, primary clarification. Solids and floatables are removed, digested, and disposed of in landfills. Disinfection (and dechlorination) is provided on the Bayside. The Ocean discharge is 4 1/2 miles from shore and does not require chlorination to meet State WQS. As discussed previously, the flow-through treatment in removing floatables and settleable solids

appears to meet the requirements of the definition. The solids and floatables removed during the flow-through treatment are flushed to the treatment plants after the storms subside and receive the normal treatment and disposal. The flow-through discharge is not chlorinated and chlorination has not been determined as necessary.

Figure 2



E. Conclusion

The WQS which formed the basis for the San Francisco program have resulted in the wastewater facilities providing more treatment than that required by the "presumption" approach as outlined in the *Combined Sewer Overflow Control Policy*.

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Appendix A

Figure 2 Assumption

Figure 2 provides a graphic comparison based on performance of the technology-based minimum requirements (BPT, BCT, and BAT) and the water quality-based program being implemented in San Francisco. The figure also includes the performance expected from the "Presumption" Approach (suboption 2) which is one of the options for complying with water quality standards in the proposed *CSO Control Policy*. The performance criteria for this graphic is suspended solids removal from the storm flow.

The following assumption were used in completing this graphic (additional assumptions are presented in the main text):

- **BPT/BCT**

The most substantial requirement in this set of minimum technology standards is the requirement to maximize flow to the sewage treatment plant. On San Francisco's Westside, prior to the CSO construction program, the sewers were capable of delivering approximately 17% of the incremental storm flows to the Richmond/Sunset treatment plant. This facility provides primary treatment and removes, during storm conditions, approximately 40% of the suspended solids from the wastewater. Consequently the pre-program storm flow pollutant control on the Westside was roughly 7% (i.e., 17% X 40%) of the total pollutant burden in the storm flow. For the purposes of the graphic this figure has been increased to 10% as an optimistic assessment of the potential performance of BPT/BCT in reducing suspended solids in the storm flows.

- **BAT**

In the Attachment, we assumed that the *CSO Strategy*'s minimum control technology #6 (control of floatables and solids) was a BAT requirement. The type of facilities EPA considered in adopting the *Strategy* were screening, swirl concentrators, and related "partial" control technologies. The performance of these technologies for suspended solids removal is typically in the range of 15% TSS removal. Baffling is also a technology used for floatables control, however, its impact on TSS will be very limited. BMP and pollution prevention programs could also be considered as BAT controls. The impact of these efforts on TSS values may not be significant, however, since they are often focused on toxicant control.